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Field of the invention

The present invention is related to tracking of individuals in a flock by means of radio communication and positioning systems.

Background of the invention

As long as livestock farming has existed, it has always been necessary to herd animals, protecting them against predators and accidents, and keeping them together for making the loss of animals as low as possible.

Even today, traditional herding, which has been used for thousands of years where one or more persons always follow the flock as long as they are on free pasture, is the most common.

Naturally, this old fashioned herding is very expensive as it continuously occupies human recourses in a very ineffective way. This is the reason why many farmers have decided to skip herding, but, as a consequence, by the end of the season the loss of animals has been considerable. However, there is an increasing demand in the public opinion for high food quality, but also for a good treatment of the animals in their lifetime.

One way of remotely tracking animals is to place a VHF radio transmitter on the individual animals of interest and determining their approximate positions based upon the signal strength of the radio signals from the transmitter at a receiver. This solution has traditionally been used for scientific purposes on wild individual animals. It is not designed for collecting data other than for an approximate position, and each monitored individual animal must be provided with a long distance transmitter, which will be relatively expensive for a whole flock. Besides, a transmitter also transmitting additional condition data,

e.g., body temperature and humidity, would be rather heavy. It would be preferred that not all animals in a flock would have to carry a heavy weighted transmitter possibly in addition to a processor managing the data.

Consequently, there is a need for a system remotely tracking animals in a flock with a minimum of heavy weighted equipment and with the possibility of monitoring the condition and health of the animals.

Summary of the invention

It is an object of the present invention to provide an arrangement that eliminates the drawbacks described above. The features defined in the claims enclosed characterize this method.

Brief description of the drawings

Figure 1 is an overview of the structure of the system according to the present invention.

Detailed description of preferred embodiments

The present invention takes advantage in the fact that animals on pasture intend to follow each other in a flock. Animals like sheep, cattle and reindeer are by nature gregarious animals and it is also in the farmer's interest that the animals always stay in a flock.

The system according to the present invention comprises a main terminal localized on the leader of the flock - from now on called the bell sheep, or alternatively on a limited number of the animals within the flock. This main terminal is preferably a terminal operating in a public radio communication network like GSM, GPRS, UMTS, or even WLAN. In addition, a position tracker, preferably a GPS receiver, is integrated in the main terminal. For communication with

the other animals in the flock, the main terminal is also provided with a short distance radio transceiver, e.g. a bluetooth device or a device operating in the ISM frequency bands or other open frequency bands (like 433MHz). The communication with the respective distributed terminals is separated according to the protocol being used (e.g. bluetooth or 433mHz protocol).

Each of the other animals in the flock is provided with a much simpler terminal which task only is to communicate with the main terminal placed on the bell sheep by means of the chosen short distance communication system (e.g. bluetooth or 433Mhz). Preferably, this terminal should be small enough to form an earmark on the animal's ear. Each distributed terminal is assigned an identification (ID) uniquely identifying the associated animal. The short distance radio transceiver in the main terminal will act as a mobile base station and portal for the distributed terminals within the flock. The mobile base stations for a number of flocks in the system then create a dynamic piconet structure of moving coverage areas.

The distributed terminals are only able to communicate with the main terminal when the respective animals are localized within the coverage area of the main terminal. In other words, an animal is regarded as being lost from the flock when the main terminal is unable to communicate with the distributed terminal of the respective animal.

Furthermore, the main terminal may be provided with a processor and a memory for storing and processing the data received from the distributed terminals. This data includes as a minimum the above-mentioned ID. Preferably, the data may also include different condition data, e.g. body temperature, collected from different sensors on the animal. The time period between transmissions of data to the main terminal may be constant, e.g. 5 - 10 min., and

when the distributed terminals are not transmitting, they are set in an idle modus for saving battery power.

According to the system of the present invention, and as already indicated, the main terminal will always know the presence of all the animals in the flock, simply by checking if the respective distributed terminals transmit data and/or respond on a request. Any change in the presence condition for an animal will be reported to the central system controller described below. The system will also keep track of the position of the bell sheep, and hence also the approximate position of the rest of the flock, due to the positioning system (preferably a GPS receiver) integrated in the main terminal and the fact that the animals in communication with the bell sheep have to be in the proximity of the bell sheep.

This presence and positioning information, and possibly the additional data mentioned above, will then be available for the external world due to the fact that the main terminal is connected to a public radio communication network like GSM, GPRS, UMTS, or WLAN.

According to a preferred embodiment of the invention, each individual animal may roam from one flock to another and then start communicating with the bell sheep in a new flock. The roaming animal will then be registered as a member of the new flock and deleted in the old flock, and repositioned according to the position of the bell sheep.

There will be a need for a central system controller managing, i.a., the availability of the data in each flock and the roaming feature mentioned above. The system controller may store (e.g. in a database) all animals registered in the system and associated information, such as in which flock a respective animal is presently localized, which sensors are arranged on the animal, if there are any alarms active for that animal etc. The system

controller keeps track of to which flock each animal currently belongs in, that when a main terminal of a flock detects signals transmitted from a new roaming animal, it will relay the ID of the animal to the central system controller and mark it as an ID of a new member of the flock. The central system controller will then update the information in its databases regarding to which flock the animal currently belongs.

The system controller includes middleware and provides an application interface allowing a third part system developer to fetch data from the animals and to configure the system. The functionalities of the application interface should preferably be at 6/7 layer in the OSI model, and the platform of the system controller is preferably based on EJB (Enterprise Java Beans).

As a user example, when a system user wants to fetch, e.g., the position of a certain animal registered in the system, the user transmits a request to the system controller. The system controller will know to which flock the animal currently belongs, and relays the request to the main terminal of the corresponding bell sheep over the radio communication system being used. The main terminal responds by returning the current position provided by its own GPS receiver. If the request is related to other data, the main terminal will fetch the data for the animal of interest already stored in the memory, or transmit a request to the distributed terminal of the animal. The middleware will also provide other features like streaming of data, configuration of equipment, monitoring of parameters, etc.

Further, according to a preferred embodiment of the present invention, the system is provided with an alarm feature. An alarm associated with an animal will be activated when periodic signals from that animal fail to occur within a predefined time period since last detected signal. The

alarm may, e.g., trigger sending of an e-mail or a short message to a person being responsible for the animal.

The main advantage of the present invention is that it allows monitoring of all animals of a flock with only a cheap and simple short distance transceiver (e.g. as an ear marker) placed on each animal.

Further, the present invention utilizes the fact that short distance radio communication equipment has limited radio coverage area to detect when an animal has lost its flock. This is also utilized to determine an approximate position of an animal only by providing one or a limited number of animal(s) with positioning tracker(s) (GPS receiver) per flock.

The present invention also allows the animals in the system to roam from one flock to another without being regarded as lost.

Even if the invention has been described in connection with animal flocks and herding, it may advantageously be utilized for tracking other individuals gathered together, e.g. as a security system for human beings travelling in groups.

Patent claims

1. A system of tracking individuals divided into one or more flocks wherein one or more individuals in each flock, from now on called flock leaders, are provided with a respective first electronic device including a position tracker and radio communication equipment, characterized in that the radio communication equipment includes at least a first transceiver operating in a public radio communication network, and a second transceiver operating in a short distance radio system, the individuals not being provided with the first electronic device are provided with a second electronic device including at least a third transceiver also operating in the short distance radio system adjusted to communicate with the second transceiver of said radio communication equipment, each individual indicates its presence in a flock by transmitting at least an identification code uniquely identifying the individual to the flock leader(s) of the flock through the short distance radio system.

2. System according to claim 1, characterized in a system controller communicating with the flock leader(s) of each flock through the public radio communication network managing the system and storing system information and information regarding all registered individuals of the system including at least the identity of each individual, to which flock each individual currently belongs, an indication of which individuals being the flock leader(s) of each flock and a public radio communication network address of all the flock leader(s) of the system.

3. System according to claim 1 or 2, characterized in that the transmission of at least an identification code uniquely identifying the

respective individuals to the flock leader(s) of the flock is accomplished periodically.

4. System according to claim 1, 2 or 3, characterized in that the first electronic device also includes a memory and a processor for storing at least the identities of the individuals currently associated with the corresponding flock.

5. System according to any of the preceding claims, characterized in that the individuals are provided with sensors sensing data regarding the condition of each individual.

6. System according to claim 5, characterized in that the data is transmitted from the individuals to the associated flock leader together with the identification code and stored in the memory of the respective first electronic device.

7. System according to one of the claims 2 - 6, characterized in that the system controller includes an application interface allowing a third party or a user of the system to fetch data regarding the individuals.

8. System according to one of the claims 2 - 7, characterized in that an individual is allowed to roam from a first flock to a second flock, in which case the system controller is updated so that the information regarding the flock belonging of the individual is changed from the first flock to the second flock.

9. System according to one of the claims 2 - 8, characterized in that an alarm is activated for an individual when a predefined time period since last reception of data from the individual to the flock leader of the individual's associated flock has

elapsed and no other flock leader of the system has received data from the individual within the same time period.

10. System according to claim 9, characterized in that the alarm initiates sending of an e-mail or a short message to a person responsible for the individual for which the alarm is activated.

11. System according to any of the preceding claims, characterized in that the public radio communication network is a GSM, GPRS, UMTS or WLAN network and the public radio communication network address is a telephone number or an IP address.

12. System according to any of the preceding claims, characterized in that the position tracker is a GPS receiver.

13. System according to any of the preceding claims, characterized in that the short distance radio system is a bluetooth system or a system operating in the ISM frequency bands or other open frequency bands like 433mHz.

14. System according to any of the preceding claims, characterized in that the individuals are animals.

15. System according to claim 14, characterized in that the second electronic device is formed as a collar or a lightweighted earmark attached to a respective ear of each animal.

16. System according to any of the preceding claims, characterized in that first electronic devices act as mobile base stations in a dynamic piconet

structure of moving coverage areas limited by the coverage areas of the second transceivers of the respective first electronic devices.

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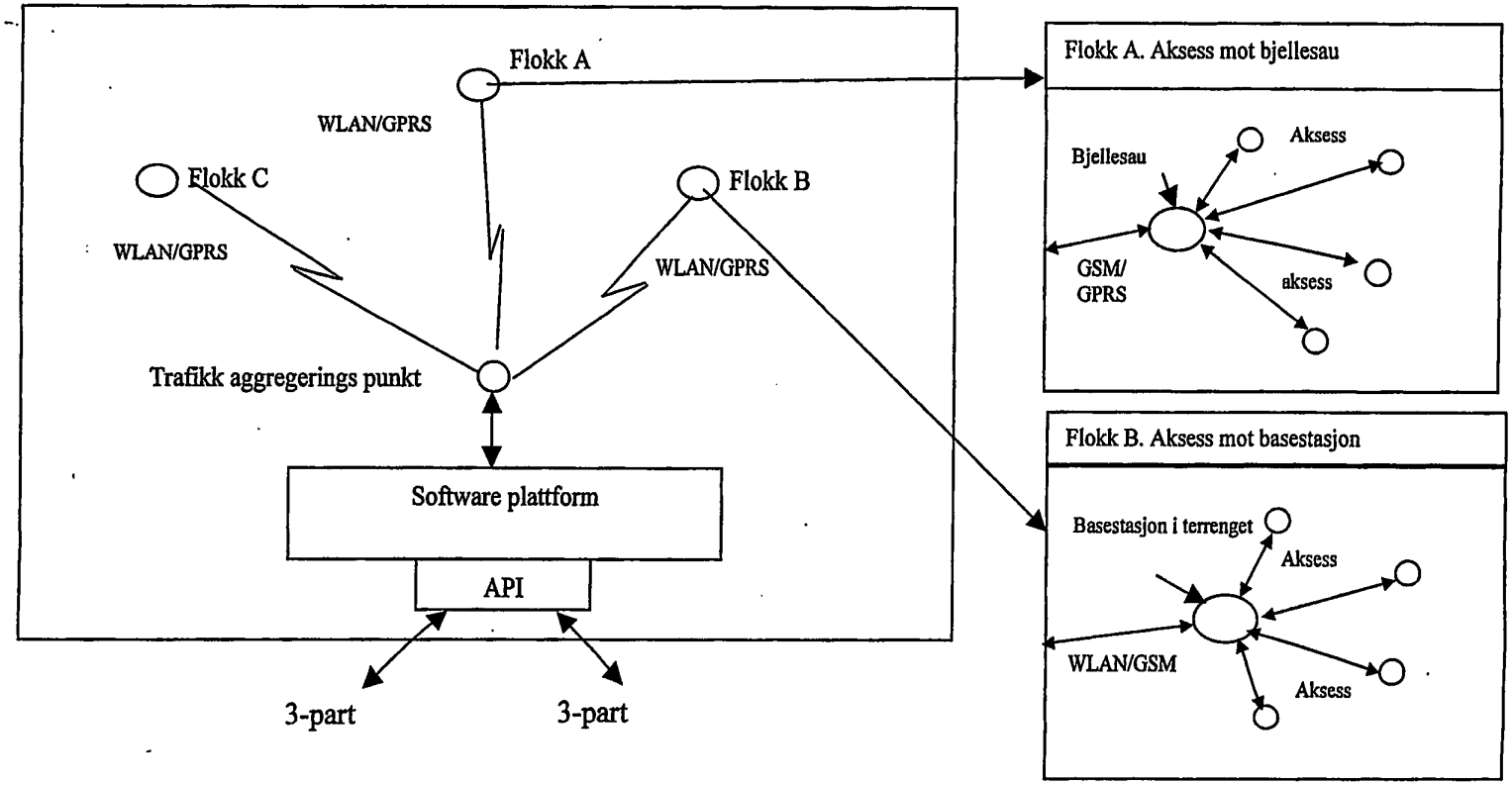
Abstract

A system of tracking individuals divided into flocks by means of radio communication and positioning systems is disclosed. A flock leader is provided with a first electronic device comprising a first transceiver being able to operate in a public radio communication network e.g. GSM or GPRS, a position tracker e.g. a GPS-receiver, and a second transceiver being able to operate in a short distance radio communication system e.g. bluetooth. Each of the remaining individuals in the flock is provided with a second electronic device comprising at least a third transceiver also being able to operate in the short distance radio communication system. The second electronic device periodically transmits data identifying the associated individual to the first electronic device, so that the flock leader knows that the individual is localized in the flock (i.e. within the coverage area of the short distance radio communication system) as long as it receives the data. The first electronic device communicates with a system controller through a public radio communication network managing the system and keeping track of the individuals in each flock. The data of the individuals (position, flock, health condition, lost/not lost) are available for system users through an application interface in the system controller.

Single figure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3-part
Flokk A. Aksess mot bjellesau
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